# INTRODUCTION TO JAVA

Computer programming involves using programming language (e.g., C or Java or C++ or Python) that gets translated into the CPU (central processing unit) using a compiler (a platform independent of the computer program that converts source code- .java file, in to bytecode - .class file) to input instructions that can control a computer.
Java was created in the beginning of 1990 by James Gosling as an object-orientated programming language for efficient use of home appliances, however, was unfamiliarised until the late 1990s given that it was evidently slower than the pre-existing C/C++. With internet being developed in the late 1990s/early 2000s, its position prevailed, leading up to this day, where it is a widely used by programmers. Java consists mainly of two platforms being, JAVA SE (standard edition) which is used for PG application development on the desktop, JAVA ME (Mobile Edition) which is developed for use in portable small devices.

## - VARIABLES & DATA-TYPE –

**Variable (변수):** Placeholder for a quantity that may change (space to store values)

"Declares a variable named xx of data type (int) and assigns the initial value α to this variable”

$$\overbrace{\texttt{int}\quad\texttt{xx}}^{\text{Variable declaration (변수 선언)}}\quad\underbrace{\texttt{=}\quad\alpha}_{\text{Variable initialization (변수 초기화)}}$$

int: Data-type
xx: Name of variable
=: operator
α: Variable contents

Decimal numbers and **binary numbers:** x/y/z/r are either 0 or 1

$$\overbrace{x\cdot(2^3)+y\cdot(2^2)+z\cdot(2^1)+r*(2^0)}^{\text{Decimal number}}$$
$$=\underbrace{(x\cdot 1000)+(y\cdot 100)+(z\cdot 10)+(r\cdot 1)}_{\text{Binary number}}$$

| | | |
|---|---|---|
| 0 | 0 | $0\cdot 2^0=0$ |
| 1 | 1 | $1\cdot 2^0=1$ |
| 5 | 101 | $1\cdot 2^2+0\cdot 2^1+1\cdot 2^0=5$ |
| 9 | 1001 | $1\cdot 2^3+0\cdot 2^2+0\cdot 2^1+1\cdot 2^0=9$ |
| 10 | 1010 | $1\cdot 2^3+0\cdot 2^2+1\cdot 2^1+0\cdot 2^0=10$ |

**Byte:** The basic unit of information which consists of 8 adjacent binary digits (bits)

**Primitive data types (Data types that already exist in the JAVA language)**

| | TYPE | DATA TYPE | DEFAUT SIZE | DEFAULT VALUE | RANGE<br>$-2^{(\#\ of\ bits\ -1)}\sim(2^{(\#\ of\ bits\ -1)}-1)$ | SPECIFIER/NOTES |
|---|---|---|---|---|---|---|
| Numeric | Integer | byte | 1 byte<br>(8 bits) | 0 | -128 ~ 127<br>$-2^7\sim(2^7-1)$ | %d<br>Example:<br>int n1 = 33, n2=10;<br>result = n1 + n2;<br>System.out.printf("%d %c %d = %d\n", n1, '+', n2, result);<br>*Output: 33 + 10 = 43* |
| | | short | 2 bytes<br>(16 bits) | 0 | -32,768 ~ 32,767<br>$-2^{15}\sim(2^{15}-1)$ | |
| | | int | 4 bytes<br>(32 bits) | 0 | -2,147,483,648 ~ 2,147,483,647<br>$-2^{32}\sim(2^{32}-1)$ | |
| | | long | 8 bytes<br>(64 bits) | 0L | -9,223,372,036,854,775,808 ~ 9,223,372,036,854,775,807<br>$-2^{64}\sim(2^{64}-1)$ | |
| | Character | char | 2 bytes<br>(16 bits) | \u0000 | 0~65,535<br>**a = 97**, b =98, c=99<br>**A = 65**, B = 66, C =67<br>Char a = “A” → A<br>Int a → 97 | %c |
| | Floating-point | float | 4 bytes<br>(32 bits) | 0.0f | -3.4E38 ~ +3.4E38 | %f<br>(Number of decimal places by default is always 6 decimal places: 8 characters)<br>Example: |
| | | double | 8 bytes<br>(64 bits) | 0.0d | 1.7E308 ~ + 1.7E308 | |

|  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  | double d1 = 10;<br>System.***out***.printf("d is%5.1f", d1);<br><br>*Output: d is 10.0*<br>*in the '%5.1f', 5 indicates the width and 1 represents the number of decimal places |
| Boolean |  | boolean | 1 byte (8 bits) | false | True/false | %b |

**Reference data type:** Object types that contain reference/address of dynamically created object that only stores the address of these values

- **Class types:** This reference type points to an object of a class.
- **Array types:** This reference type points to an array.
- **Interface types:** This reference type points to an object of a class which implements an interface.

**Constants:** A value that cannot be changed once assigned, defined by using the **final** keyword. Identifier name must be in capital letters.

- **Numeric Constants:** Numeric constants are the constants that contains numerals. It may also have a leading sign and decimal point.
- **Non-numeric constants:** Character Constants and String constants

| **Backslash Character Constants** (escape characters)<br>**(All in quotation marks)** | **DESCRIPTION** | **EXAMPLE INPUT** | **EXAMPLE OUTPUT** |
|---|---|---|---|
| **\t** | It is used to insert a **tab** in the text at this point. | String str = "Andrew\tGarfield"<br>*System.out.println(str);* | Output: Andrew<br>Garfield |
| **\'** | It is used to insert a **single quote** character in the text at this point. | String str2 = "Wall Street\'s";<br>*System.out.println(str2);* | Wall Street's |
| **\"** | It is used to insert a **double quote** character in the text at this point. | String str3 = "\"JavaTpoint\"";<br>System.out.println(str3); | "JavaTpoint" |
| **\** | It is used to insert a **backslash character** in the text at this point. | *String str4 = "And\\Or";*<br>*System.out.println(str4);* | And\or |
| **\n** | It is used to insert a **new line** in the text at this point. | String str5 = "the best way\nto communicate \nan idea \nis to act it out";<br>*System.out.println(str5);* | the best way<br>to communicate<br>an idea<br>is to act it out |

**Casting:** When you assign a value of one primitive data type to another type (when size of the data type is different).

**byte** → **short** → **char** → **int** → **long** → **float** → **double**

| **Widening Casting (automatically):** Converting a smaller byte value to a larger byte space. | **Narrowing Casting (manually):** Converting a larger byte value to a smaller byte space (must indicate using parenthesis) |
|---|---|
| int number = 10;<br>long number2 = number;<br>*Since, long > int, this is an example of widening casting | double pi = 3.14;<br>int pi2 = (int)pi;<br>*Since, long < int, this is an example of narrowing casting |
| *Output: 10* | *Output:3* |